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The oral health of dentally anxious 5 and 8 year olds:

A secondary analysis of the 2013 Child Dental Health Survey.

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Key points.-

- Children with dental anxiety are more likely to experience dental decay and experience treatment that carries more risk, such as general anaesthetic.
- Dentally anxious children are less likely to be brought to the dentist for regular dental examinations and are less likely to brush their teeth twice a day.
- The oral health of dentally anxious children impacts more on family life than children with no dental anxiety.
- By not considering the inter-relationship that factors such as poor oral health and attendance patterns have with dental anxiety, the standard definition of dental phobia maybe too simplistic.
- Similar surveys should examine the anxiety level, oral health beliefs and related behaviours of the child's caregiver to gain a fuller understanding of the aetiology and management of dental anxiety in young children.

Abstract

Introduction. Little research has been conducted into the relationships between dental anxiety and factors relating to oral health in small children. This research takes advantage of data from the Child Dental Health Survey 2013 to perform a secondary analysis for the 5 and 8 year old age groups.

Aim. To compare the oral health of children aged 5and 8 year old groups, classified into 3 levels of anxiety.

Design. Secondary analysis of data from 2289 children aged 5 years and 8 years in the Child Dental Health Survey 2013.

Setting. National Survey

Materials and Methods. Participants were grouped into 3 groups, depending on the parent's report of their dental anxiety. Descriptive analyses compared the three groups on social demographic factors, clinical status, self-reported oral health status, oral health related behaviours and oral health impact.

Results. Dentally anxious children were more likely to have active decay and decay experience. Parents of children with dental anxiety were more likely to report that the child's oral health had a negative effect on family life. Highly anxious children were less likely to attend the dentist or engage in oral health related behaviours.

Conclusions. Dentally anxious children have more dental disease and their parents express that the child's oral health has a greater impact on their family's quality of life.

Introduction

Dental fear and anxiety in children often impedes their effective treatment.[1] However, few studies have looked at the wider impact of dental phobia on oral health.

Definition of dental anxiety and phobia

Dental anxiety involves a feeling of dread that something will happen in relation to dentistry, combined with a sense of losing control.[2]

Dental phobia is defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM–V) as a specific phobia that is

(i) a severe and out of proportion fear within a certain context to the presence or anticipation of a specific object or situation, (ii) the subject becomes immediately anxious following exposure to the stimuli. This may take the form of a situationally bound or situationally predisposed panic attack, (iii) the person is able to understand that the reaction is out of proportion, (iv) the subject avoids the situation or endures it with intense distress. (v) the subject's reaction to the fearful stimulus interferes significantly with the person's everyday life.[3]

However, dental anxiety and phobia may well be inexplicably linked with factors such as the child only attending in pain, resulting in uncomfortable procedures. [2] Therefore, it may not be possible to view dental phobia as a singular disorder, but rather a symptom of a wider disorder where anxiety and other factors such as poor oral health are closely interrelated.

The reported prevalence of dental fear in children varies widely. For example, a review of studies between 1982 and 2006 by Klingsberg and Broberg [2] suggested around 9% of children said they had a dental fear. These patients were from normal populations in Australia, Canada, Europe and the USA. Other more recent studies have quoted higher figures. For example, a sample of over 2000 6 year olds from a low to medium low socioeconomic status reported a prevalence of dental fear of 22%. [4] Most studies suggest that females show a higher dental fear level than males.

Although the 2013 Child Dental Health Survey (CDHS) in the UK reported on children's anxiety levels (21 % of 5 year olds and17% of 8 year olds suffered from moderate to severe anxiety),[5] there was no in depth look at the relationships between dental anxiety and oral health status, oral health related behaviours and oral health related quality of life. Most research undertaken has concentrated on adults.[6,7,8] A few studies have looked at the affect of dental phobia on the child's quality of life,[9] while others have sought to gain more knowledge through qualitative research. [10]

This research wishes to complete a descriptive analysis of the relationship between dental anxiety in younger children and variables relating to oral health and oral health related behaviour, utilising the considerable data set gathered from the CDHS.

Materials and methods

Data were taken from the CDHS (2013), commissioned by the Health and Social Care Information Centre. The children surveyed were 5 years, 8 years, 12 years and 15 years of age. The full methodology of the survey can be found in the technical report here: https://files.digital.nhs.uk/publicationimport/pub17xxx/pub17137/cdhs2013-technical-report.pdf

Grouping of patients in relation to the parent's report of the child's anxiety levels.

The 5 and 8 year olds were categorised via a questionnaire, filled in by the parent, that asked them to rate their child's anxiety in general terms. This was on a scale ranging from 1 (not at all anxious) to 10 (extremely anxious). For this study, the participants were divided into 3 categories: VAS scores of 1-3(n=789, 78%), VAS scores of 4-6(n=305, 13%) and VAS scores of 7-10(n=195, 8%).

Data analysis

The variables deemed relevant were selected and tabulated. These included clinical variables, parental reported child's oral health status, parental reported child's oral health behaviours and the impact of the child's oral health on the family.

Using SPSS (version 25) a simple statistical analysis was conducted using cross tabulation and chi-squared test. To judge if results were deemed significant, a Bonferroni correction was applied. This was to allow for the increased chance of a rare event leading to incorrectly rejecting the null hypothesis as multiple hypothesis were being tested. Following this correction, the result was deemed significant if $P \leq 0.002$

The following variables where extracted from the data set to see if there is a relationship between the three different groups.

Socio-demographic

- Gender

- Free school dinner eligibility. The CDHS used this as a measure of poor socio-economic status. Parents can claim free school dinners for their children if they claim unemployment benefits, an income related support allowance or due to immigration status.

Variables found at clinical examination

- Number of sound, missed, filled teeth (decay experience). This was scored in the CDHS by the 2003 criteria which states "All teeth with cavitated or visual dentine caries, restorations with cavitated or visual dentine caries, teeth with filled decay (otherwise sound) and teeth extracted due to caries. Excludes teeth with enamel caries present. The term obvious decay experience relates to teeth with dentinal cavities, missing teeth and filled teeth in the DMFT dental decay index.". [(11)] To allow statistical testing this was grouped into no decay experience and decay experience.

- Active decay. The measure used from the data set scored both cavitated and non cavitated carious lesions. Again, this was grouped into two groups; no decay present and decay present.

- Indications of soft tissues lesions: ulceration, fistula or abscess (PUFA). This was used as measure of clinical consequences of untreated dental caries. The PUFA index records the presence of severely decayed teeth with visible pulpal involvement, ulceration due to tooth fragments, fistula and abscess. The results were grouped into a) no PUFA lesion seen and b) PUFA lesion seen.

Parental report of child's oral health status;

- Parent reported child had toothache in last 6 months. Grouped into yes or no.

Parental report of the impact of child's oral health on family life

- Impact on family life of child's dental health in last 6 months. This information was gathered via seven questions taken from the Family Impact Scale. [(12)]

Parental report of child's behaviour related to oral health. -

- Frequency of brushing teeth. This was grouped into children who brushed twice a day as recommended and those who brushed less than twice a day.
- Use of different oral hygiene product. For example, manual toothbrush, electric toothbrush, dental floss. This was grouped into if the child used the product or not.
- Usual dental attendance. This was grouped into children who attended for regular check ups and children who only attended when in pain/never at all. •
- Parent reported child had general anaesthetic for dental treatment. Grouped into yes or no.
- Parent reported child had sedation for dental treatment. Grouped into yes or no.

To calculate the size of the difference between the three population groups, Cohen's h was used to establish if the difference was meaningful.[13]

Results

In the three categories, VAS scores 1-3 had 1789 children (78%), VAS scores of 4-6 had 305 children (13%) and VAS scores of 7-10 had 195 children (8%).

The socio-demographic variables are shown in Table 1. The percentages indicate the proportion of participants in each group. For example, in the group VAS score 1-3, 49% were male and 51% were female. There was no significant difference in terms of gender or eligibility to free school meals.

Table 1

Socio-demographic features

		VAS score 1-3	VAS score 4-6	VAS score 7-10	$\chi 2$	P value
Gender	Male	877 (49%)	147 (48%)	94 (48%)	0.1	0.949
	Female	912 (51%)	158 (52%)	101 (52%)		
Free school dinner eligibility	Yes	251 (14%)	48 (16%)	32 (17%)	1.5	0.479
	No	1490 (86%)	251 (84%)	153 (83%)		

The variables related to the clinical examination of the participants (Table 2) showed that children who scored higher VAS scores were more likely to have active decay, fillings in permanent teeth and evidence of previous decay experience. However, they were not more likely to have had primary teeth filled, or have teeth extracted due to decay. There was a suggestion that more anxious children have more signs of untreated dental disease (using the PUFA index) but this was not deemed as significant ($P = 0.005$).

Table 2 Variables reported following clinical examination.

Variable		**VAS score 1-3**	**VAS score 4-6**	**VAS score 7-10**	**$\chi 2$ [2]**	**P value**

Number of teeth with active decay	0 teeth	1277 (71%)	181 (59%)	107 (55%)	35.418	<0.002
	1+	512 (29%)	124 (41%)	88 (45%)		
Number of permanent teeth filled	0 teeth	1752 (98%)	289 (95%)	185 (95%)	16.1	<0.002
	1 + teeth	37 (2%)	16 (5%)	10 (5%)		
Number of deciduous teeth filled	0 teeth	1546 (86%)	234 (77%)	158 (81%)	0.7	0.419
	1 + teeth	243 (14%)	71 (23%)	37 (29%)		
Number of teeth extracted due to decay	0	1769 (99%))	299 (98%)	190 (97%)	3.7	0.154
	1+	20 (1%)	6 (2%)	5 (3%)		
PUFA	No	1652 (96%)	269 (91%)	177 (94%)	10.5	0.005
	Yes	72 (4%)	25 (9%)	11 (6%)		
Any decay experience	No	1159 (65%)	147 (48%)	89 (46%)	51.1	<0.002
	Yes	630 (35%)	158 (52%)	106 (54%)		

The parent's report of the child's oral health status is reported in Table 3.

Children who scored higher on the VAS were more likely to report having toothache in the last 6 months.

Table 3 Parental report of child's oral health status

Variable		**VAS score 1-3**	**VAS score 4-6**	**VAS score 7-10**	**$\chi 2$**	**P value**
Reported toothache in the last 6 months	Not mentioned	1573 (88%)	276 (90%)	161 (83%)	18.5	<0.002
	No	216 (12%)	29 (10%)	34 (17%)		

The parent report of the impact of child's oral health on family are shown in Table 4

It is noticeable that children whose parents rated them as dentally anxious also reported a significant impact on family life caused by the child's oral health.

Table 4

Affect of oral health of quality of life

Variable		**VAS score 1-3**	**VAS score 4-6**	**VAS score 7-10**	**χ2**	**P value**
Has child's oral health impacted on family life?	No impact	1439 (81%)	201 (67%)	106 (55%)	89.665	<0.002
	Some impact	331 (19%)	100 (33%)	87 (45%)		

The variables relating to oral health related behaviour are shown in Table 5. Parents who reported that their children were dentally anxious were less likely to brush more than twice a day or use fluoridated toothpaste in the last year. Children in the more anxious groups were also more likely to only attend when in trouble or not at all. Parents also reported that anxious children were also more likely to have had a general anaesthetic for dental reasons. The same applies for children having sedation for dental reasons although the cases were few.

Table 5 – Oral health related behaviour

Variable		**VAS score 1-3**	**VAS score 4-6**	**VAS score 7-10**	**χ2**	**P value**
Frequency of brushing teeth	X2 a day	1507 (86%)	240 (79%)	142 (77%)	15.9	<0.002
	X1 a day or less	253 (14%)	63 (21%)	43 (23%)		
Used manual brush in last year	No	195 (11%)	28 (9%)	34 (17%)	9.016	0.011
	Yes	1594 (89%)	277 (91%)	161 (83%)		

Used electric brush in last year	No	981 (55%)	166 (54%)	113 (58%)	0.7	0.690
	Yes	808 (45%)	139 (46%)	82 (42%)		
Used toothpaste in the last year	No	55 (3%)	10 (3%)	20 (10%)	25.5	<0.002
		1734 (97%)	295 (97%)	175 (90%)		
Used fluoride drops in last year**	No	1772 (99%)	303 (99%)	194 (99%)	0.6	0.748
	Yes	17 (1%)	1 (1%)	1 (1%)		
Used mouthwash in the last year	No	11023 (57%)	175 (57%)	127 (65%)	4..6	0.101
	Yes	766 (43%)	130 (43%)	68 (35%)		
Used floss in the last year	No	1676 (94%)	282 (92%)	187 (96%)	2.4	0.302
	Yes	113 (6%)	23 (8%)	8 (4%)		
Used disclosing tablets in last year.	No	1685 (94%)	289 (95%)	180 (92%)	1.4	0.50
	Yes	104 (6%)	16 (5%)	15 (8%)		
Used sugar free chewing	No	1497 (84%)	246 (81%)	156 (80%)	3.0	0.222

gum in the last year						
	Yes	292 (16%)	59 (19%)	39 (20%)		
Pattern of attendance at dentist	For regular check ups	1749 (98%)	287 (94%)	178 (92%)	30.4	<0.002
	Only when trouble/never	34 (2%)	17 (6%)	15 (8%)		
Reported that child had a general anaesthetic for dentistry	Yes	90 (5%)	29 (10%)	34 (17%)	47.881	<0.002
	No	1699 (95%)	276 (90%)	161 (83%)		
Reported that child had sedation for dentistry	Yes	57 (3%)	22 (7%)	6 (3%)	12.060	0.002
	No	1732 (97%)	283 (93%)	189 (97%)		

For results deemed as statistically significant, Cohen's h was used to establish the size of the difference between the population groups (VAS score 1-3, VAS score 4-6, VAS score 7-10). Table 6 shows these results. The difference can be described as small if h = 0.20, medium if h = 0.50, and large if h = 0.80. Population groups were compared in pairs. While a number of comparisons showed a small effect size, only the impact of the child's oral health on family life in children with no or mild anxiety versus children vs children with severe anxiety yielded a medium effect size.

Table 6

Calculation of effect size using Cohen's h

Variable	Cohen's h VAS score 1-3 vs VAS score 4-6	Cohen's h VAS score 4-6 vs VAS score 7-10	Cohen's h VAS score 1-3 vs VAS score 7-10
Number of teeth with active decay	0.25	0.08	0.33
Number of teeth with permanent teeth filled	0.17	0	0.17
Any decay experience	0.34	0.04	0.38
Reported toothache in last 6 months	0.06	0.21	0.14
Impact of oral health on family life	0.32	0.25	0.57
\Tooth brushing frequency	0.19	0.05	0.23
Used toothpaste in last year	0	0.3	0.3
Reported that child had a general anaesthetic for dentistry	0.19	0.20	0.40

Discussion.

The results of this research suggest that dentally anxious children are more likely to have experienced more dental decay, attend the dentist infrequently and have treatment that carries more risk, such as a general anaesthetic. By analysing effect size it is demonstrated that the oral health of dentally anxious children impacts far more on their family life compared to children with little dental anxiety.

However, the results of this study must be viewed with caution. The measures used to rate the child's anxiety has some major drawbacks. Firstly, grouping dental anxiety via the VAS method has less validation compared to other methods, such as an validated assessment or clinical judgement. Despite there being some evidence to support its use,[14] other studies suggest that parents cannot accurately measure a child's anxiety.[15] Indeed, there is some evidence to suggest that parent's often rate their child's anxiety higher than the child.[16]. Much of the other data gathered is from by proxy reports, but to some extent this is inevitable when gathering data from young children.

Previous research has highlighted a notable relationship between the child's and parent's dental anxiety levels, especially in the young age ranges examined here. [17] The question should be raised that we may be measuring the parent's anxiety levels rather than the child. Additionally, there is also a

suggested relationship between the child's oral health related behaviours, such as toothbrushing, and the parent's own behaviour. [17,18,19] As the child's caregiver is often in direct control of many of the factors listed here, such as dental attendance, sugar consumption and tooth brushing habits, future studies like the Child Dental Health Survey would greatly benefit from gathering data from the caregiver on their dental anxiety and oral health related behaviours to establish if the child's oral health and oral health behaviour mirrors the caregiver.

The relationship between gender and dental anxiety has been documented before. [8,17] However, this difference was not present in these young children. This may reflect a i) emerging difference in gender relating to dental anxiety and age ii) a lack of an effective anxiety measure relating to the younger age groups.

Previous studies, examining adults with dental anxiety, suggest that higher dental anxiety is seen in patients of a lower socio-economic background.[8] However, this is not demonstrated in this data analysis. Heirdari et al also suggested that dental phobics are more likely to follow preventative regimes to avoid the need for dental treatment. [8] This was not the case in our data analysis. However, the findings of the previous study are related to the use of mouth wash, which most children do not use universally as a oral hygiene measure.

This study does support previous literature that suggests the dentally anxious children are more likely to have tooth decay. It can be hypothesised that anxious children experience a higher rate of dental disease due to three factors.

Firstly, differences may be due to a third factor related to dental anxiety and oral health. For example, dental anxious children are less likely to brush their teeth more than one times a day leading to tooth decay, or use fluoridated toothpaste suggesting that some children do not brush at all.

Secondly, differences in the treatment approaches for phobic and non-phobic children. For example, practitioners may choose not to attempt to restore a tooth of a nervous child and elect for a preventative approach or wait until the child reports pain. Clinically it is more difficult to adequately restore the teeth of children who suffer with dental anxiety, leading to extractions under general anaesthesia. This is backed up by our data analysis suggesting nervous children are more likely to have had dental treatment under general anaesthetic. Previous research has suggested methods to help the profession to fully engage with non-pharmacological methods to help the nervous child cope with dental treatment.[18] In addition, research by the authors of this paper has identified that the profession in general has a poor understanding of behavioural psychology principles. [19] Therefore, identifying effective non-pharmacological management techniques such as applied behavioural analysis could help benefit patients by allowing them to be treated without pharmacological interventions and thus have the benefits of restorative dentistry.

Thirdly, the difference in children's dental attendance pattern. Children in this study presented less regularly if they had reported dental anxiety. Previous research has highlighted that adult dental phobics tend to attend more irregularly. [19,21] In this study, one would presume that the parents or caregivers are responsible for the child attending. Sadly, the data prevents us from drawing any firm conclusions about the reasons behind this. It may be due to a lack of knowledge about the importance of oral health and the need for regular check ups, a preconceived belief about the inevitability of tooth decay or the parent avoiding the dentist due to their own dental anxiety. Further research is needed to fully explore these theories.

This study has helped highlight some of the more obvious relationships between dental anxiety in children and factors relating to oral health. It also highlights some of the differences between children and adults in this regard. As this work demonstrates it may not be possible to simply look at dental phobia as a disease entity by itself. The links between poor oral health, pain only attendance and other

factors needs to be fully explored via further statistical analysis to gain a true understanding of what the term “dental phobia” fully means, rather than the simplified definition given in DSM V.

Further research in this field will help the dental profession gain a valuable insight into the nature of dental anxiety and related factors and how the profession can aid these patients.

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